COMMERCIAL SEED PRODUCTION OF CONSERVATION PLANT MATERIALS IN THE USA

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Abstract

The United States of America (USA) has a large, regulated, high standard and profitable seed industry. It provides seed for growing vegetable and fruit crops, animal forages, soil and water conservation plants, landscape ornamentals and for food consumption. Economically, the conservation plant seed industry is based on supply and demand. Technically, the seed industry is interdependent on the originator (breeder or collector), grower, conditioner, dealer and consumer. Certified seed production has proven the most practical and dependable way to ensure quality seed while maintaining the genetic integrity of an ecotype or cultivar. Seed certification through state crop improvement associations (CIA) provides reliable seed supplies, economic returns and high quality performance-tested products. The originator of the selected or manipulated ecotype or cultivar evaluates the plant materials performance and adaptation through a series of experimental methods and program steps. Superior germplasm is cooperatively released for general public use. The originator maintains the foundation certified seed and provides limited quantities to qualified growers through the CIA or conservation districts. These private growers produce seed of the new plant cultivar for profit. They sell the seed to land managers who use it to solve resource problems, grow animal forage, etc. The process of ecotype and cultivar selection leading toward certification and commercial seed production has proven to be an effective program. This program delivers quality seed supplies to meet consumer needs while supporting a viable seed industry.

Key Words: cultivar, certification, conservation plants, seed production.

INTRODUCTION

In the past, "wildland" or native harvest was the major source of native seeds for revegetation of disturbed, altered or deteriorated native rangelands in the USA. However, the seed supply of wildland harvested native species fluctuates widely and is not dependable due to annual growing season-precipitation, temperatures, inter-species competition, etc. The seed sources obtained from native harvests often lose their origin and genetic identity in the market place, and can contain unwanted or weedy plant species. In addition, they may not establish or persist when used in areas where they are not adapted to the climatic, physiographic or edaphic conditions.

The production of native or introduced grass, legume and forb seed on cropland is the most practical method to insure dependable and adapted seed supplies of forage species (Holzworth et al. 1990). Seed produced from cultivated fields is superior to seed produced from native stands for several reasons:

1. Seed production under controlled conditions (cultivation, irrigation or wide-row spacing, monoculture, etc.) is more reliable because it allows for optimum spikes per plant, spikelets per spike, pollination and fertilization of florets and,therefore, seed yield is increased.
2. Cultivated seed yields from cultivated fields can exceed native harvest by 200% or more.
3. Seed produced from native plant communities is of poorer quality than seed produced on cultivated fields. Typically, seedlots from native harvests have a low purity (contain more seeds of undesirable species, other crops and inert materials) and have a lower seed weight than seed harvested from cultivated fields.
4. Seed fields are planted and harvested using known cultivars that have been selected for superior performance and tested for their area of adaptation. A cultivar is an assemblage of cultivated plants that is clearly distinguished by any character-morphological, physiological, cytological or chemical-when reproduced sexually or asexually, and continues to retain its distinguishing characteristics. In contrast, the adaptation and performance of native harvest seed is unknown beyond its local range of occurrence.

CULTIVAR SELECTION & RELEASE FOR SPECIES IMPROVEMENT

Over the past 50 to 60 years germplasm collection, improvement, selection and seed increase has provided superior cultivars for forage, reclamation and wildlife. The majority of the conservation and forage cultivars have been developed through plant breeding programs or selected from native or foreign populations by the Soil Conservation Service (SCS), Plant Materials Centers (PMCs); Agriculture Research Service (ARS) Plant Introduction Stations and forage breeding teams; University and Agricultural Experiment Station (AES) plant breeders; and, to a limited degree, private industry (Haas, 1988).

Much of the work to select and develop conservation plants and technology for their use is done by SCS plant materials centers located throughout the USA (Sharp et al., 1992). Each PMC serves an area with topographic and climatic characteristics similar to those of the PMC.

The PMCs use a systematic approach to select and develop conservation plants and technology for their use. The approach is as follows:

1. Identify the conservation problems within a PMC service area to determine which plants or techniques are needed. There is national emphasis on:
   * reducing soil erosion on agricultural and other lands;
   * improving and protecting the quality of surface and ground water;
   * improving the condition and production of grazing lands;
   * protecting upland riparian areas and coastal shorelines;
   * providing protective cover on man-made and naturally disturbed areas;
   * improving wildlife habitat; and
   * accelerating the commercial production of conservation plants that are in high demand.
2. Determine what plants might have potential and what techniques need to be developed for their successful use.
3. Initiate work by collecting identified plant materials throughout a species range of occurrence and/or developing needed techniques;

4. Evaluate the plant assemblies and techniques. This phase may take place at the PMC or on-site where the plant materials or techniques are needed. It includes three progress levels:

a. Initial - Rapid screening of many plants or techniques that might have potential for solving one or more conservation problems. Only the best are selected for advanced evaluation.
b. Advanced - Superior plants or techniques selected from the initial evaluations are tested in actual use situations. Culture, establishment, management, harvest and seed conditioning techniques are determined.
c. Final - This stage is carried out in large, manageable plantings on farms and ranches, or wherever the problem actually exists.

5. Develop commercial sources and public acceptance of a new plant and/or newly developed technique. This step may involve the following:

a. Provide genetically-pure propagules of the selected and released plant cultivars to commercial growers.
b. Carry out a public information program to promote the successful use of new plants and techniques in soil and water conservation programs.

All PMCs work closely with a number of federal and state agencies. Many times a PMC has developed a special or unique plant or technique through cooperative relationships. Genetic manipulation and/or enhancement of promising germplasm is accomplished by research agencies through breeding systems, gene transfer, etc.

SCS PMCs have major assemblies of native and introduced plants, and work mainly on species for which there are not adapted cultivars available for use in their respective areas. ARS breeding teams concentrate on species needing improvement over existing cultivars, particularly introduced grasses. AES works in both areas often having cooperative studies with PMCs and ARS. Most of the forage grass, forb and legume breeding work is being conducted by these public programs.

SEED CERTIFICATION PROGRAM

Along with the advent of cultivar releases of genetically superior plants with known performance and ranges of adaptation, the states adopted a seed certification program. The purpose of seed certification is to provide a service to the public for insuring increase of quality seed and other propagules of cultivars. Labeling insures that seed is distributed and sold in such a manner as to insure genetic integrity and mechanical purity (University of Wyoming, 1992). Certified seed production has proven the most practical and dependable way to insure quality seed while maintaining the genetic integrity and purity of an ecotype or cultivar. Seed certification through state crop improvement associations provides for reliable seed supplies, economic returns (viable businesses) and high quality performance-tested products. Certified seed is more marketable than uncertified seed because it has proven adaptation and performance ranges (Holzworth et al., 1990). Sharp (1990) reported the value of seed and plant propagules from 217 SCS released cultivars exceeded $68.1 million. The Association of Official Seed Certifying Agencies reported 206,059 hectares of certified grass, legume, forb and shrub production during 1992 (Table 1). In order to meet state seed certification standards, the seed producers must have fulfilled minimum standards regulated by the state certifying agency:

1. Known origin of seedstock. Proof must be presented that the production field was planted from a breeder, foundation or registered class. The breeder class is seed or vegetative propagating material directly controlled by the originating institution. Foundation is the source of registered and/or certified seed. Registered is the parent stock for the production of certified seed. Certified is the progeny of foundation or registered seed.
2. Field inspection. The certifying agency must inspect the production field prior to harvest to ensure that adequate field isolation has been maintained, no prohibited noxious weeds are present, and the field has grown the true germplasm.
3. Seed quality and labeling. A representative sample from the conditioned seed lot must be sent to the certifying agency for laboratory germination and purity tests. Seed must pass certification standards before the seed can be tagged certified. Certified seed tags are for use only on the lot they have been issued for, and spot checks are made to ensure that labeling and sampling requirements have been followed. The germination tests are valid for six months and must be updated to ensure viable seed.

Table 1.
Hectares Applied for Certification in 1992 by State Seed Certification Agencies of Major USA Conservation Plant Cultivars. Association of Official Seed Certifying Agencies, 1992.

SPECIES	FOUNDATION	REGISTERED	CERTIFIED
Grasses(87 spp.)	2,457	3,867	131,186
Alfalfa	1,006	161	61,599
Medicago sativa L.			
cicer milkvetch	8	29	104
Astragalus cicer L.			
Clovers	2,253	150	9,154
Trifolium spp. &			
Melilotus spp.			
Crownvetch	4	231	193
Coronilla varia L.			
Sainfoin	5	38	166
Onobrychis viciifolia			
Scop.			
birdsfoot trefoil	43	51	3,599
Lotus corniculatus L.			
wildflowers (forbs)	4	28	77
woody species	1	2	21
TOTAL	5,780	4,557	20,6059

SUMMARY

Seed harvested from native plant communities is a source of locally adapted seed for revegetation. However, the quantity and quality of this seed varies greatly from year to year and is not reliable.

Over the last 50 years, conservation plant materials have been improved through selection and breeding programs, and are being produced commercially on cultivated lands. Performance-tested cultivars have proven superior to native harvest by increasing seed availability through commercial production, and dependability through performance-testing for solving conservation problems vegetatively. The production and use of certified seed has proven to be a dependable way to guarantee a quality product to the end user.

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